MASTER OF SCIENCE
IN
MODELING VIRTUAL ENVIRONMENTS AND SIMULATION

DYNAMICALLY EXTENDING A NETWORKED VIRTUAL ENVIRONMENT USING BAMBOO AND THE HIGH LEVEL ARCHITECTURE

Stewart W. Liles-Captain, United States Army
Master of Science in Modeling, Virtual Environments, and Simulation-September 1998
Advisor: Michael Zyda, Department of Computer Science
Rudy Darken, Department of Computer Science

The design and execution of a networked virtual environment (NVE) are challenging tasks made even more difficult by the fact that NVEs are becoming more complex and difficult to manage. In a distributed environment, each simulation not only computes its own behaviors and publishes them to the network, but it must accurately represent all other entities participating in the NVE. To simplify this task, this thesis implements methods to make distributed simulations dynamically extensible, flexible, specific, and consistent. Bamboo provides the ability to dynamically extend the virtual environment by defining a convention by which plug in modules can be added during simulation runtime. The HLA provides the network communication layer that transports entity state updates to all members of the distributed simulation. These two tools combine to create a unique solution to problems inherent in designing modern networked virtual environments. The implementation is dynamically extensible which increases the flexibility implementers have in designing virtual environments. The HLA transports the entity updates and the module name that must be used to represent the entity. This method allows programmers to design only their module because modules representing other entities will load as needed during the execution. This method of implementing virtual environments promises to streamline the design and implementation process.

DoD KEY TECHNOLOGY AREAS: Computing and Software, Modeling and Simulation

KEYWORDS: Network Virtual Environment, Bamboo, High Level Architecture, HLA

A BENCHMARK USABILITY STUDY OF THE TACTICAL DECISION-MAKING UNDER STRESS DECISION SUPPORT SYSTEM

Dylan D. Schmorrow-Lieutenant, United States Navy
B.S., Western Michigan University, 1989
Ph.D., Western Michigan University, 1993
Master of Science in Modeling, Virtual Environments, and Simulation-September 1998
Advisor: Rudolph Darken, Department of Computer Science
Second Reader: George Conner, Department of Operations Research

This study evaluates the usability of a U.S. Navy Decision Support System (DSS). The DSS was developed to enhance the performance of tactical decision-makers within a Navy Combat Information Center. The goals of this study were to test the DSS against usability criteria and objectives to track future redesign efforts and system improvements. The purpose of this analysis was to: (1) assess the system's usability, (2)

---

identify problems areas in the graphical user interface, (3) report trends in user feedback, and (4) provide recommendations addressing major usability issues encountered by participants. The study tested whether the DSS met the usability objectives of: (a) 90% successful task completion, (b) ease-of-use ratings of somewhat easy or better, and (c) satisfaction ratings of somewhat satisfied or better. The DSS did not meet these usability objectives for task completion or ease-or-use; however, the DSS did meet the usability objective for user satisfaction. All participants reported that they enjoyed working with the DSS and believed that it would be a significant step forward in information management. Based on the usability data gathered in the study, recommendations are provided to address the usability issues.

DoD KEY TECHNOLOGY AREA: Human Systems Interface

KEYWORDS: Usability, Human Factors, Human Computer Interaction, Synthetic Environments, Decision Support